

*National Institute
of Standards and Technology*



*National Voluntary
Laboratory Accreditation Program*

PROGRAM HANDBOOK

CONSTRUCTION TESTING SERVICES

NISTIR 89-4039
JUNE 1990



*U.S. Department of Commerce
National Institute of Standards and Technology
Gaithersburg, Maryland 20899*

NVLAP PROGRAM HANDBOOK

CONSTRUCTION TESTING SERVICES

REQUIREMENTS FOR ACCREDITATION

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**National Voluntary Laboratory
Accreditation Program**

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U.S. DEPARTMENT OF COMMERCE
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I. PROGRAM SUMMARY

This document presents the operational and technical requirements to be fulfilled in order to gain accreditation to perform construction related testing under NVLAP. All of the steps leading to accreditation are discussed. Technical requirements are explained indicating how the NVLAP criteria are applied.

Laboratory accreditation for construction testing services was established in response to a request from the private sector. The purpose of accreditation is to recognize laboratories that produce reliable test data for the services covered, and to provide potential users with a means to select a competent laboratory for required testing.

Test Methods Covered: Concrete, aggregates, cement and admixtures soil and rock, road and paving materials (see appendix E)

Period of accreditation: One year

On-site assessment: Performed by NVLAP peer assessors, to determine compliance with NVLAP criteria, after initial application and every two years thereafter. Monitoring visits as required.

Assessors: Technical experts with experience in the appropriate fields of testing.

Proficiency testing: Calculation of within laboratory coefficients of variation, reference sample programs. Proficiency testing is conducted twice annually; advance notice of required participation will be provided.

Fees: Annual administrative/technical support fee, on-site assessment fee, proficiency testing fees.

II. INTRODUCTION

Background

The U.S. Department of Commerce, National Institute of Standards and Technology (NIST), formerly the National Bureau of Standards (NBS), administers the National Voluntary Laboratory Accreditation Program (NVLAP). NVLAP's function is to accredit public and private testing laboratories based on evaluation of their technical qualifications and competence for conducting specific test methods in specified fields of testing. Accreditation is granted on the basis of conformance with criteria published in the Code of Federal Regulations as part of the NVLAP procedures (15 CFR Part 7) (see Appendix A).

This document is intended for information and use by staff of accredited laboratories, those seeking accreditation, other laboratory accreditation systems, and others needing information on the requirements for accreditation under this NVLAP program. This document is generally included in the NVLAP Application Package along with General Application Forms, Test Method Selection Lists, and other materials needed to apply for or renew accreditation. It presents the administrative and operational procedures and technical requirements of the accreditation program and should be retained and be readily accessible to laboratory personnel.

NVLAP Accreditation

NVLAP accreditation is available to commercial laboratories, manufacturers' in-house laboratories, university laboratories, Federal, State, and local government laboratories. Foreign-based laboratories may be accredited by NIST if they meet the same requirements as domestic laboratories and pay any additional fees required (see Appendix B).

NVLAP is self-supporting and operates on a cost reimbursable basis by charging fees to those who pursue accreditation. The program receives no appropriated public funds.

Accreditation is granted only after thorough evaluation of the applicant has demonstrated that all NVLAP criteria have been met. Laboratories which successfully demonstrate compliance with the criteria are issued two documents to attest to that compliance: (1) a Certificate of Accreditation, and (2) a Scope of Accreditation which states the specific test methods and services for which the laboratories has been accredited (see Appendix D).

Why NVLAP Accreditation?

A laboratory may wish to be accredited for many reasons such as; legal requirements, regulations or codes, contract specifications, or the desire to be recognized as demonstrably competent to meet the needs of its clients.

NVLAP provides formal recognition of the competence of accredited laboratories to the user community. Information about accredited laboratories, including the name and scope of accreditation, is disseminated in various media.

For accreditation to be meaningful, it must be granted by a clearly credible organization. NVLAP provides an unbiased third party evaluation and recognition of performance as well as expert technical assistance to upgrade laboratory performance.

Testing Laboratory Defined

NVLAP defines "testing laboratory" as an organization that provides services to measure, examine, test, calibrate, or otherwise determine the characteristics or performance of materials, products or systems. See Appendix B for information about laboratory main and sub facilities.

Accreditation Defined

NVLAP accreditation signifies recognition of a testing laboratory's competence to perform specific test methods in specified fields of testing. It means that the laboratory's quality system, staff, facilities and equipment, calibration procedures, test methods and procedures, records, and test reports have all been evaluated and found to meet NVLAP criteria. NVLAP accreditation does not mean a guarantee (certification) of laboratory performance or of product test data; it is solely a finding of laboratory competence.

NVLAP Programs

Laboratories may participate in as many NVLAP programs as they wish, provided that they meet all NVLAP criteria for each program. Programs currently available are:

Acoustical Testing Services
Asbestos in Bulk Insulation and Air
Carpet
Commercial Products Testing
Paints and Coatings
Paper and Related Products
Plastics
Seals and Sealants

Computer Network Interface Protocols
Construction Testing Services
Electromagnetic Compatibility
and Telecommunications
Personnel Radiation Dosimetry
Thermal Insulation Materials
Wood Stoves

For further information about NVLAP, or for assistance in understanding and meeting the NVLAP requirements and criteria, please write or call:

NVLAP
National Institute of Standards and Technology *
Bldg 411 Room A124
Gaithersburg, MD 20899
Phone: (301) 975-4016
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* formerly the National Bureau of Standards (NBS)

III. OPERATIONAL INFORMATION AND REQUIREMENTS

The information and requirements presented in this section are generally applicable to all NVLAP programs. Technical and proficiency testing requirements presented in subsequent sections are specifically applicable to the field(s) of testing covered by this Handbook.

Laboratory Code Number (LAB CODE)

Each participating laboratory is assigned a four-digit laboratory code number. The code number is used by the NVLAP staff for identification, filing, recordkeeping, and database management. Participants are requested to put their Lab Code number on all correspondence with NVLAP. The Lab Code number is cross-referenced with the laboratory name and location in the NVLAP Directory of Accredited Laboratories.

Accreditation Period

Accreditation is granted for a period specified in the Accreditation Application Package (usually one year). The accreditation period begins on one of four dates: January 1, April 1, July 1, or October 1. Once a laboratory has been assigned an accreditation date, it retains that date as long as it remains in the program. Accreditation both expires and is renewed on that date.

Approved Signatory

The laboratory must designate one or more staff members as Approved Signatories. The name of at least one Approved Signatory must appear on all test reports endorsed with the NVLAP logo (see section Use of the NVLAP Logo elsewhere in this Handbook). This person is responsible for the technical contents of the report and is the one to be contacted by NVLAP, laboratory clients, or others in case of questions or problems with the report.

There is no formal requirement for nomination or approval of persons designated as Approved Signatories. The laboratory must inform NVLAP of its appointments by completing the appropriate sections in the General Application for accreditation. Approved Signatories should be persons with adequate responsibility or authority within the organization, with adequate and appropriate technical capabilities, and without conflict of interest.

Laboratory test reports carrying the NVLAP logo need not be signed individually by the Approved Signatory. Test report forms may be preprinted with the required information. Forms that are electronically or computer generated may have the information printed along with the test results.

Authorized Representative

The laboratory must designate an Authorized Representative to sign the application form and commit the laboratory to fulfill the NVLAP requirements. The Authorized Representative is the only one who can authorize a change in the scope or nature of the laboratory's application. The Authorized Representative may also be an Approved Signatory.

Renewal

Each participating laboratory will be sent a renewal Application Package, well in advance of the expiration date of its accreditation, to allow sufficient time to complete the renewal process. The technical requirements and fees for renewal are generally the same as for initial accreditation.

The application and fees must be received by NIST prior to expiration of the laboratory's current accreditation to avoid a lapse in accreditation. If an on-site assessment is required, the application and fees must be received to allow sufficient time for the visit to be completed and deficiencies corrected prior to expiration of accreditation. In addition, any current proficiency testing requirements must be met.

Keeping NVLAP Informed

During the accreditation period, a laboratory must inform NVLAP:

of any major changes involving the location, ownership, management structure, authorized representative, technical director, approved signatories, or facilities;

if it wishes to delete a test method; or

if it is no longer capable of performing test methods or services for which it is accredited.

If a laboratory elects not to renew or wishes to voluntarily terminate its accreditation at any time, the notification of such intention should be forwarded to NVLAP in writing.

Additions to Scope of Accreditation

During the accreditation period, a laboratory may request the addition of test methods or services to its Scope of Accreditation. The laboratory must meet all NVLAP criteria for the additional test methods or services such as fees, proficiency testing, technical requirements, etc. The need for an additional on-site assessment will be determined on a case-by-case basis.

NVLAP Directory

NVLAP publishes an annual Directory of Accredited Laboratories. The Directory contains the name and address, scope of accreditation, contact person, and the accreditation renewal date for each accredited laboratory. Supplements to the Directory are published quarterly to cover interim accreditation actions including initial accreditations, renewals, suspensions, terminations, and revocations. The Directory is distributed nationally and internationally to manufacturers, suppliers, retailers, professional and trade associations, code groups, and government agencies.

Referencing Your Accredited Status and Use of the NVLAP Logo

Accredited laboratories are encouraged, within specified limits, to announce their accredited status. The NVLAP logo may be used in such announcements. Photographic copies of the logo are available from the NVLAP office.

A laboratory must limit the representation of the scope of its accreditation to only those tests or services for which accreditation has been granted. The following statement is recommended: "Accredited by the National Institute of Standards and Technology, National Voluntary Laboratory Accreditation Program for selected test methods or service."

In Advertising

Laboratory advertising of accredited status must be limited to professional, technical, trade, or other laboratory services publications. Letterhead referencing NVLAP accreditation may be used in direct solicitation for business from potential customers. It is recommended that a copy of the NVLAP Certificate and Scope of Accreditation be appended to such a solicitation.

News stories and advertising by laboratories of their accredited status in the trade press is permissible and encouraged. The use of advertisements in the trade press is consistent with NVLAP procedures.

Laboratories may not reference their accredited status in consumer media, in product advertising, or on product labels, containers and packaging. The nature or type of product advertising prohibited by NVLAP procedures includes any advertising that is intended to encourage a consumer to purchase a product because it was tested by an accredited laboratory, whether that advertising appears in consumer media, the business media, or at a point of sale to consumers. Advertising must not imply product certification by NVLAP, NIST, or the U.S. Government.

On Laboratory Documents

As long as a laboratory is NVLAP accredited, it may use the NVLAP logo on letterhead and brochures, preferably with the qualifying quote given above. The logo may be used on test reports that are within the scope of accreditation. These reports must bear the name of an Approved Signatory in accordance with the guidelines given in the Approved Signatory section of this Handbook.

Compliance With Existing Laws

Accreditation does not relieve the laboratory of the need to observe and comply with existing Federal, State, and local statutes, ordinances, or regulations that may be applicable to its operations, including consumer protection and antitrust laws.

IV. TECHNICAL EXPERTS

NVLAP uses Technical Experts (TEs) as assessors and evaluators. They may be engineers or scientists currently active in the field, consultants, college professors or retired persons. They are selected on the basis of their professional and academic achievements, experience in the field of testing, management experience, and tact in dealing with people. Their services are generally contracted as required; they are not NVLAP staff members.

Assessors are TEs selected to conduct an on-site assessment of a particular laboratory on the basis of how well their individual experience matches the type of testing to be assessed, as well as absence of conflicts of interest. The laboratory has the right to appeal the assignment of an assessor and may request an alternate.

Evaluators are TEs selected to review the record of the laboratory as a whole, including the application, assessment report, deficiencies, corrections to deficiencies, and proficiency test results and, based on this record, to recommend whether or not a laboratory should be accredited. The evaluators are matched to the type of testing being evaluated and are selected to avoid conflicts of interest.

V. ACCREDITATION PROCESS

Accreditation is granted following successful completion of a process which includes submission of an application and payment of fees by the laboratory, an on-site assessment, resolution of deficiencies identified during the on-site assessment, participation in proficiency testing, technical evaluation, and administrative review. The process is described in the following sections.

Application and Fees

An Application Package is sent to a laboratory on request. It includes: General Application Forms, Fee Calculation forms, and the program Handbook. The General Application Form must be completed and signed by the authorized representative of the laboratory. Before completing and signing the application, the authorized representative should review all documents and become familiar with NVLAP requirements.

In general, the accreditation fee is composed of several parts, some of which are fixed while others depend on the scope of accreditation desired and the specifics of the program. The total accreditation fee must be paid before accreditation can be granted. The individual parts of the accreditation fee include, as appropriate: an Administrative and Technical Support fee, a Test Method fee, a Proficiency Testing fee, the cost of reference materials and quality assurance samples, and an On-Site Assessment fee. The fees for this accreditation program are shown in the Fee Calculation Sheet included in the Application Package.

The laboratory will be contacted to schedule a mutually acceptable date for the on-site assessment after payment of all required fees and will be notified of any additional information which must be supplied, and of any applicable proficiency testing requirements which must be completed, for the technical evaluation.

On-site Assessment

Before initial accreditation and periodically thereafter, an on-site assessment of each laboratory is conducted to determine compliance with the NVLAP criteria. The assessment is conducted by one or more NVLAP assessors selected on the basis of their expertise in the field of testing to be reviewed. Assessors use checklists developed by NVLAP so that each laboratory receives an assessment comparable to that received by others. However, assessors have some latitude to make judgments about a laboratory's compliance with the NVLAP criteria.

Each laboratory will be contacted to arrange a mutually agreeable date for an assessment. An assessment normally takes one to three days depending on the extent of the laboratory's application. Every effort is made to conduct an assessment with as little disruption as possible to the normal operations of the laboratory. During the assessment the assessor will:

- meet with management and supervisory personnel responsible for the laboratory's activities (for which accreditation is being sought) to review the assessment process with the individuals involved and to set the assessment agenda.
- examine the quality assurance system employed by the laboratory. The assessor may select and trace the history of one or more samples from receipt to final issuance of test reports. The assessor will conduct a thorough review of the laboratory's quality manual or equivalent, evaluate the training program, examine notebooks or records pertaining to the samples, check sample identification and tracking procedures, determine whether the appropriate environmental conditions are maintained, and examine copies of completed test reports.
- review records of periodic internal audits, use of check-samples or participation in round robin testing or other similar programs.

- review personnel records including resumes and job descriptions of key personnel, competency evaluations for all staff members who routinely perform the testing for which accreditation is sought, calibration or verification records for apparatus used, test reports, and sample control records.
- observe demonstrations of testing techniques and discuss them with the technical personnel to assure their understanding of the procedures.
- examine major equipment, apparatus, and facilities for appropriateness, capability, adherence to specifications, etc.

At the conclusion of the assessment, the assessor will conduct an exit briefing to discuss observations with responsible laboratory staff. A written assessment report will be left with the laboratory. The assessor will forward the assessment forms and a copy of the report to NVLAP.

Monitoring Visits

In addition to regularly scheduled assessments, monitoring visits may be conducted by assessors or by NIST staff at any time during the accreditation period. The scope of a monitoring visit may range from checking a few designated items to a complete review. Monitoring visits may occur for cause or on a random selection basis. These visits serve to verify reported changes in the laboratory's personnel, facilities, and operations or to explore possible reasons for poor performance in proficiency testing.

Proficiency Testing

Proficiency testing is an integral part of the NVLAP accreditation process. Demonstration of appropriate facilities, equipment, personnel, etc., is essential, but may not be sufficient for a complete evaluation of laboratory competence. The actual performance of tests and reporting of results using special proficiency testing samples provides NVLAP with a way to determine the overall effectiveness of the laboratory (see Appendix B).

Proficiency testing is a process for checking actual laboratory testing performance, usually by means of inter-laboratory comparisons. Each accreditation program has unique proficiency testing requirements. The data are analyzed by NVLAP and summary reports of the results are sent to the participants.

Information obtained from proficiency testing helps to identify problems in a laboratory. When problems are found, NVLAP staff members work with the laboratory staff to solve them. If problems with the test method are suspected, NVLAP provides information to the appropriate standards writing bodies.

The specific proficiency testing requirements for this Program are included elsewhere in this document.

Deficiency Notification and Resolution

A deficiency is the failure of a laboratory to meet a NVLAP criterion. Deficiencies may be determined during on-site assessments, monitoring visits, proficiency testing, NVLAP staff review, and Technical Evaluation. Laboratories are informed of deficiencies during the on-site assessment and through other correspondence.

When a laboratory is notified by NVLAP of deficiencies, the laboratory must respond in writing to NVLAP within 30 days of the notification. The response must provide documentation, signed by the authorized representative, that the specified deficiencies have either been corrected or that specific actions are being taken to make corrections. A timetable for completion of corrections should be included.

A laboratory which is currently accredited must correct all deficiencies noted within 30 days of notification or face possible revocation, suspension, or expiration without renewal of its accreditation.

Test equipment that is identified as deficient should not be used until corrective action has been completed. Evidence of correction must be sent to NVLAP.

If substantial deficiencies have been cited, NVLAP may conduct an additional on-site assessment prior to granting accreditation. All deficiencies and resolutions will be subject to thorough review and corrective actions verified during subsequent assessments and technical evaluations.

Technical Evaluation

When a laboratory is ready for an accreditation action, a final technical evaluation is conducted by experts chosen for their experience and knowledge of the pertinent test methods. They review records on each applicant laboratory and base their evaluation on:

- information provided on the application;
- on-site assessment reports;
- actions taken by the laboratory to correct deficiencies;
- results of proficiency testing; and
- information from any monitoring visits of the laboratory.

If the technical evaluation reveals additional deficiencies, written notification describing them will be made to the laboratory. The laboratory must respond within 30 days of such notification and provide documentation, signed by the authorized representative, that the specified deficiencies have been corrected. Clarification of some issues may be requested by telephone. All deficiencies must be corrected before accreditation can be granted or renewed.

Administrative Review

After the technical evaluation has been completed, the NVLAP staff prepares an administrative recommendation that the laboratory either be granted or denied accreditation. This recommendation is based on a review of the technical evaluation and other records to ensure that all NVLAP technical, financial and administrative requirements have been satisfied.

Accreditation Actions

The following accreditation actions may be taken by NIST:

Accreditation If accreditation is recommended, the recommendation forms the basis for granting accreditation. A Certificate of Accreditation and a Scope of Accreditation will be issued to the laboratory.

Denial If denial is recommended, the laboratory is notified of a proposal to deny accreditation and the reason(s) therefor.

Suspension If a laboratory is found to have violated the terms of its accreditation, the accreditation can be suspended. The laboratory will be notified of the reasons for and conditions of the suspension and the action(s) that the laboratory must take to have accreditation reinstated.

Revocation If a laboratory is found to have violated the terms of its accreditation, the laboratory is notified of a proposal to revoke accreditation and the reasons therefor. The laboratory may be given the option of voluntarily terminating accreditation. If accreditation is revoked, the laboratory must return its Certificate of Accreditation and cease use of the NVLAP logo on any of its reports, correspondence, or advertising.

If denial or revocation has been proposed, the laboratory may request, in writing, a hearing, under United States Code 5 U.S.C. 556, within 30 days of the date of receipt of the notification. If a hearing is not requested, the action becomes final upon the expiration of that 30-day period.

When accreditation has been terminated, whether voluntarily or through adverse action, the accreditation certificate must be returned to NVLAP.

VI. TECHNICAL REQUIREMENTS

Section 7.33 of the NVLAP Procedures, found in Appendix A, contains the Criteria for accreditation expressed in general terms. The following interpretive comments and additional requirements make the criteria specifically applicable to laboratories which perform construction testing services. The requirements listed in Section 7.33 and those specified in this section must be met in order to gain accreditation.

The test methods for which a laboratory may seek accreditation are listed in Appendix G. Other test methods may be added to the program, upon request, if they are found to be appropriate.

Quality System (See Sec. 7.33a, Appendix A)

In a construction testing services laboratory, the functions and activities may be quite diverse. The functions may be separated into different technical areas such as soils testing, concrete testing and bituminous testing with each area under the supervision of a different person or department. This may result in different procedures and sets of documents for each testing area. The assessor will review the procedures and documentation which support each area for which accreditation is requested.

The documents must be up-to-date and thoroughly describe all procedures and practices. They should be written in accordance with recognized industry standards and should describe such items as methods of implementation, responsible personnel, record-keeping systems, operating procedures, procedures to employ in the event of unusual or non-standard circumstances, and scheduling. Written descriptions shall include at least the following topics:

- Organizational chart;
- Laboratory facility and scope of services offered;
- Duties of key personnel;
- Personnel training procedures;
- Personnel competency assurance;
- Test equipment inventory;
- Test equipment calibration, verification, and maintenance practices;
- Specimen handling, control, and identification;
- Actions concerning damaged specimens;
- Data handling and reporting; and
- Actions when variations in test data indicate a problem exists; and
- Procedures regarding subcontracting testing - see appendix B.

The documentation must be so arranged to be readily accessible to all staff members. It may be in the form of a single manual or may be distributed, in sections, to various locations throughout the laboratory. If separate sections are used, a central reference document must be available to indicate where the individual sections may be found. The documentation must be in a format and style which can be easily understood by technicians.

Staff (See Sec. 7.33b, Appendix A)

NVLAP criteria do not require that a Professional Engineer (P.E.) be in charge of a laboratory. However, in some cases, a Standard Test Method will include such a requirement (e.g., ASTM C1077, E329). If a test method for which the laboratory desires accreditation includes the requirement, the laboratory must have a P.E. to be accredited by NVLAP for that method. If a regulatory authority requires a P.E. (other than covered in a method such as C1077 or E329), the laboratory must meet the requirement to the satisfaction of the authority independent of the NVLAP accreditation.

Training:

A laboratory must ensure that each new staff member is trained for the testing duties assigned, and that staff members are retrained when given new responsibilities or when test methods are updated.

Each staff member must receive (or have had) training for assigned testing duties either through on-the-job training, formal classroom sessions or through technician certification programs such as those conducted by the American Concrete Institute (ACI) or the National Institute for Certification of Engineering Technicians (NICET).

Competency:

In addition to training, the competency of each staff member must be evaluated by the laboratory either through an observation of performance, an oral or written examination for each test method the staff member is authorized to conduct, or other suitable means. The performance observation must be conducted annually by the immediate supervisor or a designee appointed by the laboratory director, and must be adequately documented. A record of the annual evaluation of each staff member must be dated and signed by the supervisor and placed in the personnel file.

For those staff members who are certified by a recognized organization, the supervisor must still conduct a competency evaluation at least annually and maintain a record of the results.

Facilities and Equipment (See Sec. 7.33c, Appendix A)

All facilities and equipment used for performing the applicable tests must conform with the requirements of the standard test methods. If, by modification, the equipment is different from that called for by the test method, the laboratory must provide evidence (e.g., comparative test results, round robins, analytical or mathematical proof) that use of the modified equipment results in test data which are equivalent to what would be obtained by the test equipment specified in the test method.

The laboratory workspace and any environmentally controlled spaces (storage tanks, moist rooms) will be checked for proper conditions, including monitoring devices.

Calibration (See Sec. 7.33d, Appendix A, and Appendix F)

All test equipment inherently subject to change due to use or time, must be periodically calibrated. Calibration means comparison with a reference standard so that the performance of a measuring instrument may be determined with sufficient accuracy.

All equipment used in performing accredited test methods must be calibrated (verified) according to the following order of priority:

- (1) as specified in the test method,
- (2) in accordance with the manufacturer's recommendation or,
- (3) one year.

A list of apparatus requiring verification is contained in Appendix F.

Calibrations (verifications) may be performed by the laboratory or by an external calibration service. Some specified calibrations must be traceable to NIST (U.S. laboratories), to the appropriate national standards authority (non-U.S. laboratories), or to natural physical constants. Calibration certificates must be retained and made available for an assessor's inspection during the on-site visit. Traceability should be stated on the calibration certificate. If calibration is performed by the laboratory, metrology standards used and assurance of the maintenance of any required environmental conditions must be documented.

Equipment calibration (verification) records should include the following (in addition to Sec. 7.33c.3, Appendix A :

- Identity of the laboratory individual or external service responsible for calibration;
- Source of reference standard and traceability; and,
- Calibration data.

Test Methods and Procedures (See Sec. 7.33e, Appendix A)

A laboratory must have written procedures for the technicians to follow when conducting a test. These may be custom written by the laboratory (using the proper method as the reference) or may be a copy of the actual test method. The laboratory must have in-house the latest published versions (within one year of publication) of all the test methods for which accreditation has been requested, and any applicable referenced standards, practices, or procedures such as:

- ASTM C511 - Standard Specification for Moist Cabinets and Rooms
ASTM E4 - Load Verification of Testing Machines.
ASTM E11 - Standard specification for Wire Cloth Sieves

Records (See Sec. 7.33f, Appendix A)

Records covering the following items are required and will be reviewed during the on-site visit either in total or by selective sampling:

- Staff training dates and results;
- Staff competency review dates and results;
- Equipment calibration and maintenance;
- Test data and reports; and
- Specimen control

Specimen control records must trace the movement of specimens from sampling/receipt to completion of testing. Dates, times, condition of sample and names of personnel involved should be included.

Laboratory records must include the following items for each set of companion concrete cylinders tested:

- Concrete supplier;
- Concrete mix;
- Description of field curing facility;
- Field curing temperature;
- Field curing time;
- Method of moisture loss prevention;
- Ambient temperature and weather conditions on job site;
- Slump;
- Unit weight of concrete;
- Weight of unit weight bucket (tare);
- Concrete cylinder diameter measurements per ASTM C39;
- Air content;
- Name of person making cylinder;
- Name of person breaking cylinder;
- Breaking strength;
- Structure sample taken from; and
- Location in structure where sample was taken.

Test Reports (See Sec. 7.33g, Appendix A)

All test reports issued with a NVLAP Logo applied must meet the test report requirements. In addition to Sec. 7.33g, the report must contain any unique requirements specified in a test method.

A laboratory is accredited to perform tests in "strict conformance" with the standard test method as written. If a laboratory knowingly deviates from a method during the performance of a test the deviation must be described on the final test report.

If any test or portion of a test is performed by a subcontractor see appendix B for requirements.

Accreditation of Temporary Facilities

Construction testing laboratories may have temporary testing facilities at a jobsite, or mobile facilities to service several jobsites. When these types of facilities are an extension of a permanent laboratory facility, they may be included in the same accreditation. If the temporary facilities use the same procedures, are under the same management structure, use identical apparatus and personnel and otherwise meet all the NVLAP criteria they can be included in the permanent facility's accreditation (see appendix B).

During the on-site assessment the assessor will randomly select temporary sites to visit. Mobile facilities present special circumstances and will be assessed with particular regard to the equipment contained and the special problems involved with maintaining environmental and calibration conditions.

There is no limit as to the number of temporary facilities that may be included in an accreditation; however, if one of the temporary facilities fails to meet the NVLAP criteria upon an inspection visit the accreditation of the entire organization will be jeopardized. The scope of accreditation will list all temporary sites included in the accreditation.

An organization may be accredited for only a temporary facility. Such a facility must meet the same NVLAP criteria as a permanent facility. The accreditation will cover only the site initially installed and will be suspended when the facility moves to a new site. The accreditation can be reinstated following an on-site visit demonstrating that the laboratory meets all NVLAP criteria.

VII PROFICIENCY TESTING

Within-Laboratory Proficiency Program

Laboratories testing concrete must perform a WITHIN-LABORATORY PROFICIENCY PROGRAM. This program is designed to be a laboratory quality assurance tool. It requires calculating the coefficients of variation for concrete cylinders made by the personnel of the laboratory (not contractor's cylinders) during regular business operations. This program must be implemented by a laboratory within 90 days after application for accreditation. (see appendix G) The data tables developed from this program need not be sent to NVLAP; they will be reviewed by the assessor during the on-site assessment.

Inter-laboratory Proficiency Testing Program

All laboratories are required to participate in programs for the analysis of material reference samples. Participation in these proficiency testing programs will vary from year to year, depending on the laboratory's scope of accreditation. Instructions for participating in proficiency testing will be provided as required. Laboratories must submit results of proficiency testing to NVLAP when completed.

Applicant laboratories may be required to participate satisfactorily in proficiency testing prior to initial accreditation. Laboratories renewing accreditation must have participated satisfactorily in all required proficiency testing during the previous accreditation period.

APPENDICES

- A - NVLAP Procedures, Subpart D,
"Conditions and Criteria for Accreditation"
- B - NVLAP Policy Guide No. 10
"Main Laboratory Facilities and Subfacilities"

NVLAP Policy Guide No. 11
"Use of Subcontractors by Accredited Laboratories"
- NVLAP Policy Guide No. 12
"Test Reports Issued by Accredited Laboratories"
- NVLAP Policy Guide No. 13
"Satisfactory Proficiency Testing is a Requirement for
Accreditation"
- NVLAP Policy Guide No. 14
"Accreditation of Foreign Laboratories"
- C - NVLAP Lab Bulletins
- D - Sample Certificate of Accreditation
Sample Scope of Accreditation
- E - Test Method Selection (Scope of Accreditation)
- F - Calibration Requirements
- G - Within-Laboratory Proficiency Test Program

APPENDIX A

NVLAP Procedures

NVLAP PROCEDURES - TITLE 15, PART 7, CODE OF FEDERAL REGULATIONS

SUBPART D - CONDITIONS AND CRITERIA FOR ACCREDITATION

Sec. 7.31 Application of accreditation conditions and criteria.

(a) To become accredited and maintain accreditation, a laboratory must meet the conditions for accreditation set out in Section 7.32 and the criteria set out in Section 7.33 as tailored for specific LAPs.

(b) The conditions leading to accreditation include acceptance of the responsibilities of an accredited laboratory and requirements for information disclosure.

(c) The criteria are tailored and interpreted for the test methods, types of test methods, products, services or standards of the relevant LAP. These tailored criteria are the technical requirements for accreditation developed through the procedures of Section 7.15.

(d) In applying the conditions, criteria, and technical requirements for accreditation, the Director of OPSP shall not:

- (1) Prohibit accreditation solely on the basis of a laboratory's affiliation or nonaffiliation with manufacturing, distributing, or vending organizations; or because the laboratory is a foreign firm; or
- (2) Develop, modify, or promulgate test methods, standards, or comparable administrative rules.

Sec. 7.32 Conditions for accreditation.

(a) To become accredited and maintain accreditation, a laboratory shall agree in writing to:

- (1) Be assessed and evaluated initially and on a periodic basis;
- (2) Demonstrate, on request, that it is able to perform the tests representative of those for which it is seeking accreditation;
- (3) Pay all relevant fees;
- (4) Participate in proficiency testing as required.
- (5) Be capable of performing the tests for which it is accredited according to the latest version of the test method within one year after its publication or within another time limit specified by the Director of OPSP;
- (6) Limit the representation of the scope of its accreditation to only those tests or services for which accreditation is granted;
- (7) Limit all its test work or services for clients to those areas where competence and capacity are available;
- (8) Limit advertising of its accredited status to letterheads, brochures, test reports, and professional, technical, trade, or other laboratory services publications, and use the NVLAP logo under guidance provided by the Director of OPSP;

- (9) Inform its clients that the laboratory's accreditation or any of its test reports in no way constitutes or implies product certification, approval, or endorsement by NBS;
- (10) Maintain records of all actions taken in response to testing complaints for a minimum of one year;
- (11) Maintain an independent decisional relationship between itself and its clients, affiliates, or other organizations so that the laboratory's capacity to render test reports objectively and without bias is not adversely affected;
- (12) Report to the Director of OPSP within 30 days any major changes involving the location, ownership, management structure, authorized representative, approved signatories, or facilities of the laboratory; and
- (13) Return to the Director of OPSP the certificate of accreditation for possible revision or other action should it:
 - (i) be requested to do so by the Director of OPSP;
 - (ii) voluntarily terminate its accredited status; or
 - (iii) become unable to conform to any of these conditions or the applicable criteria of Section 7.33 and related technical requirements.

(b) To become accredited and maintain accreditation, a laboratory shall supply, upon request, the following information:

- (1) Legal name and full address;
- (2) Ownership of the laboratory;
- (3) Organization chart defining relationships that are relevant to performing testing covered in the accreditation request;
- (4) General description of the laboratory, including its facilities and scope of operation;
- (5) Name and telephone number of the authorized representative of the laboratory;
- (6) Names or titles and qualifications of laboratory staff nominated to serve as approved signatories of test reports that reference NVLAP accreditation; and
- (7) Other information as may be needed for the specific LAP(s) in which accreditation is sought.

Sec. 7.33 Criteria for accreditation.

(a) Quality System.

- (1) The laboratory shall operate under an internal quality assurance program appropriate to the type, range, and volume of work performed. The quality assurance program must be designed to ensure the required degree of accuracy and precision of the laboratory's work and should include key elements of document control, sample control, data validation, and corrective action. The quality assurance program must be documented in a quality manual or equivalent (e.g., operations notebook) which is available for use by laboratory staff. A person(s) must be identified as having responsibility for maintaining the quality manual.

- (2) The quality manual must include as appropriate:
 - (i) The laboratory's quality assurance policies including procedures for corrective action for detected test discrepancies;
 - (ii) Quality assurance responsibilities for each function of the laboratory;
 - (iii) Specific quality assurance practices and procedures for each test, type of test, or other specifically delineated function performed;
 - (iv) Specific procedures for retesting, control charts, reference materials, and interlaboratory tests; and
 - (v) Procedures for dealing with testing complaints.
 - (3) The laboratory shall periodically review its quality assurance system by or on behalf of management to ensure it's continued effectiveness. These reviews must be recorded with details of any corrective action taken.
- (b) Staff.
- (1) The laboratory shall:
 - (i) Be staffed by individuals having the necessary education, training, technical knowledge, and experience for their assigned functions; and
 - (ii) Have a job description for each professional, scientific, supervisory and technical position, including the necessary education, training, technical knowledge, and experience.
 - (2) The laboratory shall document the test methods each staff member has been assigned to perform.
 - (3) The laboratory shall have a description of its training program for ensuring that new or untrained staff are able to perform tests properly and uniformly to the requisite degree of precision and accuracy.
 - (4) The laboratory shall be organized:
 - (i) So that staff members are not subjected to undue pressure or inducement that might influence their judgment or results of their work; and
 - (ii) In such a way that staff members are aware of both the extent and the limitation of their area of responsibility.
 - (5) The laboratory shall have a technical manager (or similar title) who has overall responsibility for the technical operations of the laboratory.
 - (6) The laboratory shall have one or more signatories approved by the Director of OPSP to sign test reports that reference NVLAP accreditation. Approved signatories shall:
 - (i) Be competent to make a critical evaluation of test results; and
 - (ii) Occupy positions within the laboratory's organization which makes them responsible for the adequacy of test results.
- (c) Facilities and Equipment.
- (1) The laboratory shall be furnished with all items of equipment and facilities for the correct performance of the tests and measurements for which accreditation is granted and shall have adequate space, lighting, and environmental control, and monitoring to ensure compliance with prescribed testing conditions.
 - (2) All equipment must be properly maintained to ensure protection from corrosion and other causes of deterioration. Instructions for a proper maintenance procedure for those items of equipment which require periodic maintenance must be available. Any item of equipment or component thereof

which has been subjected to overloading or mishandling, gives suspect results, or has been shown by calibration or otherwise to be defective, must be taken out of service and clearly labelled until it has been repaired. When placed back in service, this equipment must be shown by test or calibration to be performing its function satisfactorily.

- (3) Records of each major item of equipment must be maintained. Each record must include:
- (i) The name of the item of equipment;
 - (ii) The manufacturer's name and type, identification and serial number;
 - (iii) Date received and date placed in service;
 - (iv) Current location, where appropriate;
 - (v) Details of maintenance; and
 - (vi) Date of last calibration, next calibration due date, and calibration report references.
- (d) Calibration. The laboratory shall:
- (1) Calibrate new testing equipment before putting it into service;
 - (2) Recalibrate, at regular intervals, in-service testing equipment with the calibration status readily available to the operator;
 - (3) Perform checks of in-service testing equipment between the regular calibration intervals, where relevant;
 - (4) Maintain adequate records of all calibrations and recalibrations; and
 - (5) Provide traceability of all calibrations and reference standards of measurement where these standards exist. Where traceability of measurements to primary (national or international) standards is not applicable, the laboratory shall provide satisfactory evidence of the accuracy or reliability of test results (e.g., by participation in a suitable program of interlaboratory comparison).
- (e) Test Methods and Procedures. The laboratory shall:
- (1) Conform in all respects with the test methods and procedures required by the specifications against which the test item is to be tested, except that whenever a departure becomes necessary for technical reasons the departure must be acceptable to the client and recorded in the test report;
 - (2) Have data to prove that any departures from standard methods and/or procedures due to apparatus design or for other reasons do not detract from the expected or required precision of the measurement;
 - (3) Maintain a test plan for implementing testing standards and procedures including adequate instructions on the use and operation of all relevant equipment, on the handling and preparation of test items (where applicable), and on standard testing techniques where the absence of such instructions could compromise the test. All instructions, testing standards, specifications, manuals, and reference data relevant to the work of the laboratory must be kept up-to-date and made readily available to the staff;
 - (4) Maintain measures for the detection and resolution of in-process testing discrepancies for manual and automatic test equipment and electronic data processing equipment, where applicable;

- (5) Maintain a system for identifying samples or items to be tested, which remains in force from the date of receipt of the item to the date of its disposal, either through documents or through marking to ensure that there is no confusion regarding the identity of the samples or test items and the results of the measurements made; and
 - (6) Maintain rules for the receipt, retention, and disposal of test items, including procedures for storage and handling precautions to prevent damage to test items which could invalidate the test results. Any relevant instructions provided with the tested item must be observed.
- (f) Records. The laboratory shall:
- (1) Maintain a record system which contains sufficient information to permit verification of any issued report;
 - (2) Retain all original observations, calculations and derived data, and calibration records for one year unless a longer period is specified; and
 - (3) Hold records secure and in confidence, as required.
- (g) Test Reports.
- (1) The laboratory shall issue test reports of its work which accurately, clearly, and unambiguously present the specified test results and all required information. Each test report must include the following information as applicable:
 - (i) Name and address of the laboratory;
 - (ii) Identification of the test report by serial number, date, or other appropriate means;
 - (iii) Name and address of client;
 - (iv) Description and identification of the test specimen, sample, or lot of material represented;
 - (v) Identification of the test specification, method, or procedure used;
 - (vi) Description of sampling procedure, if appropriate;
 - (vii) Any deviations, additions to, or exclusions from the test specifications;
 - (viii) Measurements, examinations, and derived results supported by tables, graphs, sketches, and photographs, as appropriate, and any failures identified;
 - (ix) A statement of measurement uncertainty, where relevant;
 - (x) Identification of the organization and the person accepting technical responsibility for the test report and date of issue;
 - (xi) A statement that the report must not be reproduced except in full with the approval of the laboratory; and
 - (xii) A statement to the effect that the test report relates only to the items tested.
 - (2) The laboratory shall issue corrections or additions to a test report only by a further document suitably marked, e.g. "Supplement to test report serial number" which meets the relevant requirements of Section 7.33(g)(1).
 - (3) The laboratory shall retain a copy of each test report issued for one year unless a longer period is specified by the Director of OPSP.
 - (4) The laboratory shall ensure that all test reports endorsed with the NVLAP logo are signed by an approved signatory.

APPENDIX B

NVLAP Policy Guides

POLICY GUIDE

Number 10

June 1988

(Reprinted June 1989)

This Policy Guide presents NVLAP definitions of the types of laboratory facilities which may be granted NVLAP accreditation, the requirements and conditions that must be satisfied in order to achieve accreditation, and procedures that NVLAP will follow in evaluating various types of facilities for their conformance to accreditation criteria.

Definitions:

a. Main (laboratory) facility:

- (1) permanently (at all times) maintains staff, equipment, procedures, documentation, and facilities necessary to perform the tests, for which it seeks accreditation;
- (2) implements all quality assurance procedures;
- (3) maintains and retains all records, and issues test reports; and
- (4) may be a permanently fixed site or a permanent mobile facility.

b. Sub-facility is physically separate from, but considered an extension of, its main facility. Although it may have all staff, equipment, procedures, and documentation necessary to perform the requisite tests, it receives technical direction and quality assurance management from the main facility.

1. A permanent sub-facility maintains staff, equipment, procedures, documentation, and facilities necessary to perform the tests, for which it seeks accreditation, at all times. It may be a permanently fixed site or a permanent mobile facility and is expected to remain in operation for at least one year.
2. A temporary sub-facility is provided with staff, equipment, procedures, documentation, and facilities necessary to perform the tests, for which it seeks accreditation, on an interim basis, to meet the needs of the main facility. A temporary sub-facility may be established at a fixed site or in a mobile facility and is expected to remain in operation less than one year.

Conditions for Accreditation:

NVLAP accreditation of a laboratory main facility does not extend to accreditation of sub-facilities unless the sub-facilities have been separately evaluated. These facilities are uniquely identified in the NVLAP accreditation

documents. A NVLAP-accredited laboratory must not present or report test data, produced at any non-accredited, sub-facility as having been produced under the status of NVLAP accreditation.

NVLAP offers accreditation to laboratories that are found competent to perform specific test methods or types of tests in specified fields of testing. Competence is defined as the ability to meet specific technical criteria relating to quality assurance, staff, equipment, facilities, procedures, records, and reports. Technical criteria may or may not be equally applicable to main facilities and sub-facilities. Accreditation of sub-facilities may require NVLAP criteria that address the use and maintenance of equipment and facilities, and the implementation of procedures, that are particularly applicable to the performance of specific test methods in sub-facilities. NVLAP must develop specific technical criteria upon which to base an objective evaluation of staff, facilities, equipment, and procedures employed in applicable sub-facilities.

NVLAP will accredit a main facility if the facility complies with all applicable NVLAP criteria.

NVLAP will accredit a sub-facility (in addition to the main facility) if:

- a. the laboratory main facility meets all NVLAP accreditation criteria;
- b. the laboratory main facility satisfactorily documents and maintains quality assurance procedures addressing the applicable sub-facility; and,
- c. the sub-facility complies with all applicable NVLAP criteria.

Procedures:

In principle, NVLAP will require that sub-facilities, to be included in a laboratory's accreditation, undergo on-site assessments and participate in proficiency testing. NVLAP staff, with the guidance of NVLAP technical experts, will determine the need for and extent of such evaluations based on the number and location of similar sub-facilities managed by the laboratory, the nature of the quality assurance system, and any special technical considerations. Decisions on the need for and extent of the evaluations may not be made until after the accreditation of the main facility. The conditions and requirements for evaluation of sub-facilities providing specific testing services are described in NVLAP documents pertaining to the relevant accreditation program.

Laboratories seeking NVLAP accreditation should clearly state, on the NVLAP Application Form, what type(s) of sub-facilities are to be included in the accreditation. NVLAP fees for on-site assessments and proficiency testing will be based on the number of facilities seeking accreditation that are required to undergo on-sites and participate in proficiency testing. A single administrative/technical support fee is charged to the laboratory (main facility).



POLICY GUIDE

Number 11
March 1989

USE OF SUBCONTRACTORS BY ACCREDITED LABORATORIES

When a laboratory accredited by NVLAP issues a test report containing the NVLAP logo or other indication of NVLAP accreditation, it is implied that the report reflects work performed, and results obtained, by the personnel, equipment, and procedures of that laboratory. However, in some cases a laboratory may require the use of another facility (subcontractor) e.g., due to equipment failure, need for specialized equipment, work overload, or to perform tests outside the laboratory's scope, etc., in order to meet contractual obligations.

The following policy applies whenever the NVLAP logo or other reference to a laboratory's accredited status is used on a test report.

NVLAP POLICY. Whenever a laboratory accredited by NVLAP subcontracts to another laboratory the performance of any test or portion of a test it must clearly identify in its records, and in the report to the client, specifically which test method(s) or portion of a test method(s) were performed by the accredited laboratory and which were performed by the subcontractor. The laboratory must also inform the client, before the fact, that subcontracting will be necessary.

Definition of SUBCONTRACTOR: Any facility not covered under a laboratory's NVLAP accreditation, as defined in the accreditation documents, utilized by the laboratory to produce test data, e.g., laboratories not affiliated with the NVLAP laboratory, facilities within the same corporate structure that are not included in the accreditation, such as franchises, or subsidiaries.

REQUIREMENTS NVLAP policy regarding an accredited laboratory subcontracting any test or portion of a test which will reference the laboratory's accredited status requires the following of an accredited laboratory.

1. The laboratory's policy regarding the use of subcontractors must be included in the Quality Assurance Manual.
2. The laboratory must notify the client that some testing will be subcontracted (identity of subcontractor not required in advance).

3. Any test report issued that contains data produced by a subcontractor and displays the NVLAP logo or other indication of NVLAP accreditation, must include:

Subcontractor ACCREDITED by NVLAP

- a statement at the beginning of the report prominently indicating " This report contains data which was produced by a subcontracted laboratory accredited by NVLAP for the test methods performed";
- clear indication of which data was produced by the subcontractor;
- name, address, and contact person of the subcontracted facility(ies);
- the NVLAP lab code of the subcontractor(s);
- a description of the test(s) performed, and results obtained.

Subcontractor NOT ACCREDITED by NVLAP

- a statement at the beginning of the report prominently indicating " This report contains data which was produced by a subcontracted laboratory which is not accredited by NVLAP ";
- clear indication of which data was produced by the subcontractor;
- name, address, and contact person of the subcontracted facility(ies);
- a description of the test(s) performed; and results obtained;



POLICY GUIDE

Number 12
April 1989

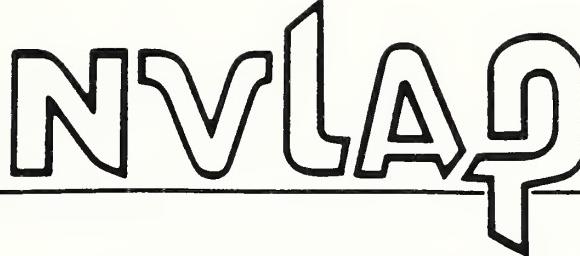
TEST REPORTS ISSUED BY ACCREDITED LABORATORIES

When a laboratory accredited by NVLAP issues a test report containing the NVLAP logo or other indication of NVLAP accreditation, it is implied that the report reflects work performed, and results obtained, under the conditions of the accreditation. Frequently however, laboratories perform other testing which is not covered by the NVLAP accreditation.

NVLAP POLICY. Whenever a laboratory accredited by NVLAP issues a test report which contains data from the performance of any test or portion of a test not covered by the accreditation it must clearly identify in its records, and in the report to the client, specifically which test method(s) or portion of a test method(s) were not covered by the accreditation. The laboratory must also inform the client, before the fact, when tests requested are not covered by the accreditation.

REQUIREMENTS. NVLAP policy regarding test reports issued by an accredited laboratory which references the laboratory's accredited status, requires the following.

- 1) Any test report that contains data from tests which are not covered by the accreditation must include:
 - a statement at the beginning of the report prominently indicating "This report contains data which is not covered by the NVLAP accreditation";
 - clear indication of which data is not covered by the accreditation
- 2) A description of the laboratory's policy regarding the use of the NVLAP logo must be included in the Quality Assurance Manual.
- 3) The laboratory must not misrepresent its accreditation. When a client requires or requests accredited services and any of the requested services are not covered by the accreditation, the client must be so advised.



POLICY GUIDE

Number 13
July 1989
(Replaces Policy
Bulletin No. 19)

SATISFACTORY PROFICIENCY TESTING IS A REQUIREMENT FOR ACCREDITATION

Accreditation by the National Institute of Standards and Technology, under the National Voluntary Laboratory Accreditation Program (NVLAP), requires that a laboratory meet all performance requirements and criteria as determined by on-site assessments and proficiency testing.

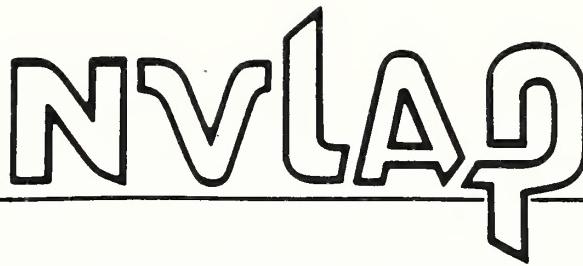
If, as the result of on-site assessments, deficiencies are found, the laboratory must satisfactorily resolve those deficiencies, in order to obtain initial accreditation or maintain accreditation.

Unsatisfactory participation in any NVLAP proficiency testing program is a technical deficiency which must be resolved in order to obtain initial accreditation or maintain accreditation.

Unsatisfactory participation in NVLAP proficiency testing programs is defined as, but not limited to, one or more of the following:

1. Failure to meet specified proficiency testing performance requirements prescribed by a standard or test method for which the laboratory is seeking accreditation. (Example: ANSI Standard N13.11 for the Dosimetry Program.)
2. Failure to participate in a regularly scheduled "round" of proficiency testing for which the laboratory has received instructions and/or materials.
3. Failure to submit laboratory control data as required.
4. Performance as a statistically outlying laboratory in two successive rounds of proficiency testing or showing a general pattern of outlying test results over three or more rounds.
5. Failure to produce test data within acceptable limits of error when testing NIST Standard Reference Materials or special artifacts whose properties are well characterized and known to NIST/NVLAP.

NVLAP will notify the laboratory of proficiency testing deficiency(s) and actions to be taken to resolve the deficiency(s). Denial or suspension of accreditation will result from failure to resolve deficiencies.



POLICY GUIDE

Number 14
July 1989
(Replaces Policy
Bulletin No. 4)

ACCREDITATION OF FOREIGN LABORATORIES

Foreign laboratories, located outside of the continental United States, may be accredited by NVLAP on the same basis as U.S. domestic laboratories. Foreign laboratories must meet the same requirements and criteria as domestic laboratories. The criteria are defined in the NVLAP Procedures and technical Handbooks provided to all applicants. Accreditation is granted based on compliance with all NVLAP criteria as determined by on-site assessments and the results of proficiency testing programs.

Since NVLAP is a cost-reimbursable program, the fees charged foreign laboratories must cover all costs in excess of those associated with the accreditation of domestic laboratories. Additional fees will be charged to foreign laboratories for travel by assessors outside of the United States and for shipment of proficiency testing materials to the laboratories.

Upon application, a foreign laboratory must forward payment of NVLAP fees (as calculated on the Fee Calculation Sheet) in U.S. currency. The laboratory will be notified of additional travel and proficiency testing costs which must be paid to NVLAP before an assessor leaves to perform the on-site assessment.

In cases where laboratory documents are not in English, or laboratory personnel do not speak English, it is the responsibility of the laboratory to provide a translator to assist the NVLAP assessor during the inspection. The translator will assist the assessor to converse directly with laboratory management and technical staff and to review laboratory documentation. Documents such as quality control manuals, protocols, standards, and test reports need not be translated into English solely for NVLAP purposes.

An export license, issued by the U.S. Department of Commerce, may be required for certain equipment to be sold outside the United States. If a foreign laboratory applying for NVLAP accreditation must own the required equipment, the laboratory must have a valid export license. For export license information call (202) 377-4811 or write to: U.S. Department of Commerce, Export Administration, Exporter Assistance, P.O. Box 273, Washington, DC 20230.

APPENDIX C
NVLAP Lab Bulletins



Scope of Accreditation

CONSTRUCTION TESTING SERVICES.

Page 2 of 2

LABORATORY, INC.

ANYTOWN, MD

Accreditation Renewal Date: January 1, 1990

<u>NVLAP Code</u>	<u>Designation</u>	<u>Short Title</u>
02/A10	ASTM C128	Specific Gravity and Absorption of Fine Aggregate
02/A11	ASTM C131	Resistance to Degradation of Small-Size Coarse Aggregates in the Los Angeles Machine
02/A12	ASTM C136	Sieve Analysis of Fine and Coarse Aggregates
02/A13	ASTM C142	Clay Lumps and Friable Particles in Aggregates
02/A14	ASTM C289	Reactivity of Aggregates (Chemical Method)
02/A15	ASTM D75	Practice for Sampling Aggregates
GEOTEXTILES		
02/L28	ASTM D4354	Sampling of Geotextiles for Testing
ROAD AND PAVING MATERIALS		
02/M08	ASTM D979	Sampling Bituminous Paving Mixtures
02/M12	ASTM D1559	Resistance to Plastic Flow - Marshall Appara.
02/M19	ASTM D2172	Quantitative Extraction of Bitumen from Bituminous paving Mixtures

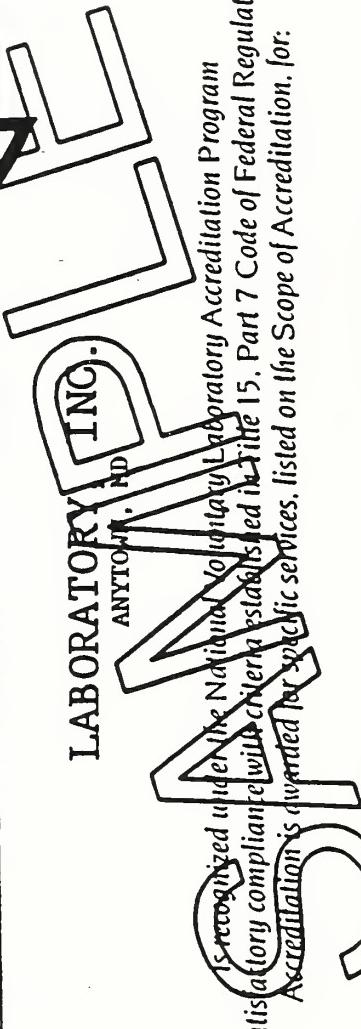


For the National Bureau of Standards

United States Department of Commerce
National Institute of Standards and Technology

INVAC

Certificate of Accreditation



January 1, 19--

Effective until

For the National Institute of Standards and Technology

APPENDIX E

Test Method Selection List

APPENDIX E
TEST METHOD SELECTION
CONSTRUCTION TESTING SERVICES

A laboratory may request accreditation for any combination of the following test methods for which it can demonstrate competence. A laboratory may also request other test methods, not listed, by writing to NVLAP or by indicating in their application the additional test methods that accreditation would be desired.

Concrete

Field Group (only available as a group)

	ASTM C31	Making and Curing Test Specimens
	ASTM C172	Sampling Freshly Mixed Concrete
	ASTM C143	Slump of Portland Cement Concrete
	ASTM C138	Unit Weight, Yield and Air Content
either	ASTM C231	Air Content-Pressure Method
or	ASTM C173	Air Content-Volumetric Method
	ASTM C39	Compressive Strength of Cylindrical Specimens
	ASTM C617	Capping Cylindrical Specimens
	ASTM C78	Flexural Strength of Concrete - Simple beam with third-point loading

Aggregates

	ASTM C29	Unit Weight and Voids in Aggregates
	ASTM C40	Organic Impurities in Fine Aggregate
	ASTM C87	Effect of Organic Impurities in Fine Aggregates on Strength of Mortar
	ASTM C88	Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
	ASTM C117	Materials Finer than 75- m (No. 200) Sieve in Mineral Aggregates by Washing
	ASTM C123	Lightweight Pieces in Aggregate
	ASTM C127	Specific Gravity and Absorption of Coarse Aggregate
	ASTM C128	Specific Gravity and Absorption of Fine Aggregate
	ASTM C131	Resistance to Degradation of Small-Size Coarse Aggregates in the Los Angeles Machine
	ASTM C136	Sieve Analysis of Fine and Coarse Aggregates
	ASTM C142	Clay Lumps and Friable Particles in Aggregates
	ASTM C289	Reactivity of Aggregates (Chemical method)
	ASTM D75	Practice for Sampling Aggregates
	ASTM D2419	Sand Equivalent Value of Soils and Fine Aggregate

Cement

ASTM C109	Compressive Strength of Hydraulic Cement
ASTM C114	Chemical Analysis of Hydraulic Cement
ASTM C115	Fineness of Portland Cement by the Turbidimeter
ASTM C151	Autoclave Expansion of Portland Cement
ASTM C157	Length Change of Hardened Cement Mortar and Concrete
ASTM C183	Sampling and Acceptance of Hydraulic Cement
ASTM C185	Air Content of Hydraulic Cement Mortar
ASTM C186	Heat of Hydration of Hydraulic Cement
ASTM C188	Density of Hydraulic Cement
ASTM C191	Time of Setting of Hydraulic Cement by Vicat needle
ASTM C204	Fineness of Portland Cement by Air Permeability apparatus
ASTM C227	Potential Alkali Reactivity of Cement-Aggregate combinations (Mortar Bar Method)
ASTM C265	Calcium Sulfate in Hydrated Portland Cement mortar
ASTM C266	Setting of Hydraulic Cement by Gillmore needles
ASTM C305	Mechanical Mixing of Hydraulic Cement Pastes and mortars of Plastic Consistency
ASTM C430	Fineness of Hydraulic Cement by the 45- m (No. 325) Sieve
ASTM C451	Early Stiffening of Portland Cement (Paste Method)
ASTM C452	Potential Expansion of Portland Cement Mortars exposed to Sulfate

Admixtures

ASTM C233	Testing Air-Entraining Admixtures for Concrete
ASTM C311	Sampling and Testing Fly Ash or Natural Pozzolans for Use as a Mineral Admixture in Portland Cement Concrete
ASTM C441	Effectiveness of Mineral Admixtures in Preventing Excessive Expansion of Concrete Due to the Alkali-Aggregate Reactions

Geotextiles

ASTM D4354	Sampling of Geotextiles for Testing
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Soil and Rock

ASTM D422	Particle Size Analysis of Soils
ASTM D427	Shrinkage Factors of Soils
ASTM D698	Moisture Density Relations of Soils and Soil-aggregate Mixtures Using 5.5-lb Rammer and 12 inch Drop
ASTM D854	Specific Gravity of Soils
ASTM D1140	Amt of Mat. in Soils Finer Than the #200 Sieve
ASTM D1556	Density of Soil by the Sand Cone Method
ASTM D1557	Moisture Density Relations of Soils and Soil-aggregate Mixtures Using 10-lb Rammer and 18 inch Drop
ASTM D1558	Moisture Content Penetration Resistance Relationships of Fine Grained Soils
ASTM D1883	Bearing Ratio of Laboratory Compacted Soils
ASTM D2166	Compr. Strength, Unconfined of Cohesive Soil
ASTM D2168	Calib. of Lab. Mech. Rammer Soil Compactors
ASTM D2216	Determination of Water (Moisture) Content of Soil, Rock, and Soil-Aggregate Mixtures
ASTM D2217	Wet Preparation of Soil Samples for Particle Size Analysis and Determination of Soil Const
ASTM D2434	Permeability of Granular Soils (Constant Head)
ASTM D2435	One-Dimensional Consol. Properties of Soils
ASTM D2487	Classification of Soils for Engr. Purposes
ASTM D2488	Descript and Ident. of Soils (Visual-Manual)
ASTM D2850	Unconsolidated, Undrained, Compressive Strength of Cohesive Soils
ASTM D2922	Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
ASTM D2974	Moisture, Ash, and Organic Matter of Peat Mat.
ASTM D3017	Moisture Content of Soil-Aggregate in Place by Nuclear Method (Shallow Depth)
ASTM D3080	Direct Shear Tests of Soils Under Consolidated Drained Conditions
ASTM D4220	Preserving and Transporting Soil Samples
ASTM D4221	Dispersive Char. of Clay Soil by Double Hydrom
ASTM D4253	Max. Index Density of Soils- Vibratory Table
ASTM D4254	Minimum Index Density of Soils and Calc. of Relative Density
ASTM D4318	Liquid Limit, Plastic Limit, and Plasticity Index of soils
Corps of Engineers	Manual EM-1110-2-1906 Appendix VII Permeability of Fine Grained Soils Using a Triaxial Apparatus
Corps of Engineers	Manual EM-1110-2-1906 Appendix X Consolidated Undrained and consolidated Drained Triaxial Test

Road and Paving Materials

ASTM D5	Penetration of Bituminous Materials
ASTM D113	Ductility of Bituminous Materials
ASTM D140	Sampling Bituminous Materials
ASTM D243	Residue of Specified Penetration
ASTM D244	Testing Emulsified Asphalts
ASTM D402	Distillation of Cut-Back Asphaltic Products
ASTM D546	Sieve Analysis of Mineral Filler
ASTM D979	Sampling Bituminous Paving Mixtures
ASTM D1074	Compressive Strength of Bituminous Mixtures
ASTM D1075	Effect of Water on Cohesion of Compacted Mixtures
ASTM D1188	Bulk Specific Gravity of Compacted Bituminous Mixtures Using Paraffin-Coated Specimens
ASTM 59	Resistance to Plastic Flow - Marshall Apparatus
ASTM 60	Resistance to Deformation and Cohesion by means of Hveem apparatus
ASTM D1561	Preparation of Specimens- California Kneading Compactor
ASTM D1856	Recovery of Asphalt by the Abson Method
ASTM D2041	Theoretical Maximum Density (Rice Method)
ASTM D2042	Solubility of Asphalt Matl in Trichloroethylene
ASTM D2170	Kinematic Viscosity of Asphalts
ASTM D2171	Viscosity of Asphalts by Vacuum Capillary Viscometer
ASTM D2172	Quantitative Extraction of Bitumen from Bituminous paving Mixtures
ASTM D2726	Bulk Density of Cores (SSD)
ASTM D2872	Effect of Heat and Air on a Moving Film of Asphalt (Rolling Thin Film Oven Test)
ASTM D3142	Specific Gravity or API Gravity of Liquid Asphalts by Hydrometer Method
ASTM D3143	Flash Point of Cutback Asphalt with Tag open cup apparatus
ASTM D3289	Specific Gravity or Density of Semi-Solid and Solid Bituminous Materials by Nickel Crucible

NVLAP will indicate that a laboratory complies with the following standard practices if (a) accreditation is granted for all test methods required by the standard practice, and, (b) all conditions and requirements stated in the standard practice are complied with. Applicants must be aware that these practices require that a Professional Engineer be in charge of the laboratory, and that performance of a minimum set of test methods is required.

ASTM E329	Recommended Practice for Inspection and Testing Agencies for Concrete, Steel and Bituminous Materials as used in Construction
ASTM C1077	Standard Practice for Laboratories Testing Concrete and Concrete Aggregates. (Requires ASTM C31, C39, C40, C117, C127, C128, C136, C138, C143, C172, C173)

APPENDIX F
Calibration Requirements

APPENDIX F

CALIBRATION REQUIREMENTS

Apparatus	Calibration or Verification Frequency
Concrete	
Compression testing machine(s) *	12 months
Bearing blocks	6 months
Temperature reading device(s) used in laboratory moist curing facility	12 months
Temperature reading device(s) used in field curing facility	12 months
Unit weight scale(s)*	12 months
Pressure air meter apparatus (C231)	6 months
Volumetric air apparatus (C173)	36 months
Molds (single use) (representative sample)	on receipt
Molds (reusable)	12 months
Slump cone(s)	12 months
Unit weight measure	12 months
Tamping rods	12 months
Capping apparatus including plates, capping material	6 months
Cement	
Testing machine(s) (C109)*	12 months
Scales (C109)	12 months
Weights (reference) (C114)*	5 Years
Balance (C114)	12 months
Microammeter (C115)	12 months
Autoclave pressure gage (C151)	12 months
Comparator (C157, C140)	12 months
Weighing device (C185)	12 months
Thermometer (C180)	12 months
Vicat apparatus (C191, C451)	12 months
Air permeability apparatus(C204)	12 months
Gillmore needles (C266)	12 months
Pressure gage (C430)	12 months
Sieves (according to E11)	12 months
Aggregates	
Balance (C29,C88,C119,C123,C127,C128, C131,C136,C140,C289)*	12 months
Measure (C29)	12 months
Testing machine (C109, C87)*	12 months
Hydrometer (C88, E100, C123)	12 months
Sieves (per E11)	12 months
Spectrophotometer (C289)	12 months

* Traceability documentation is required.

Soil and Rock

Balance (D422, D698, D854, D1556, D1557, D2166 D2216, D2217, D2434, D2435, D2850, D3080, D4221, D4253, D4254, D4318)	12 months
Thermometer (D422, D4221)	12 months
Temperature/moist Room (D422, D3080)	12 months
Timing Device (D422, D2166, D2850,	12 months
Sieves (per E11)	12 months
Rammer (D698, D1557, D1883)	1000 uses
Drying Oven (D698, D1556, D1557, D2166, D2217 D2974, D2435, D3080, D4221, D4253, D4318)	12 months
Pycnometer (D854)	12 months
Loading machine (D1883, D2166)	12 months
Nuclear Source (D2922, D3017)	Daily when used
Muffle Furnace (D2974)	12 months

Bituminous

Timing Device (D5, D2170, D2171)	12 months
Thermometer (D5, D113, D244, D402, D1559, D1856, D2170, D2171, D3142, D3143, D3289)	12 months
Testing Machine (D113, D1074, D1560, D1561)	12 months
Balance/scale (D244, D546, D1074, D1075, D1188, D1559, D1560, D1561, D2172, D3289)	12 months
Sieve (D244, D546)	12 months
Oven (D244, D546, D1074, D1559, D1560, D1561, D2042, D2172, D2872, D3142)	12 months

APPENDIX G

Within Laboratory Proficiency Program

APPENDIX G

WITHIN LABORATORY PROFICIENCY PROGRAM

This program provides a method to monitor the average variation in sets of companion cylinders (the term "set of companion cylinders" refers to a set of two or three cylinders made from a single sample of field concrete made by laboratory personnel). The method uses data from individual sets of companion cylinders and specifies a statistical analysis to indicate one-week and five-week patterns in the within-laboratory variation.

This procedure can indicate problems as they occur over a period of time. It is not intended to catch isolated mistakes, but to reveal long-term effects such as out of calibration equipment or a technician who may be consistently performing the tests improperly.

By interpreting the results of the analysis a laboratory should be able to determine when problems occur and take action to remedy them.

Data Selection

The test data selected should be from the laboratory's routine work. The concrete should have a nominal specified compressive strength between 3000 and 5000 psi and a slump exceeding two inches. The cylinders should be 6 x 12 inches and cured for 28 days. If the specimens selected are not within these limits, please note any deviations on Table II.

To perform the analyses which follow, a laboratory should use data from all the applicable tests which the laboratory performs or, if there is a very large work load, a random selection of not less than 10 tests per week. The selected test data must be recorded for submission to NVLAP. Table II shows the required information giving a suggested format which may be reproduced and used.

DATA ANALYSIS METHOD

1. For each individual set of companion cylinders calculate:

\bar{X}_i the average strength of the set in psi

and

R_i the difference (range) between the highest and lowest strength value

EXAMPLE: if cylinder #1 = 3750 psi
cylinder #2 = 3970 psi

to determine \bar{X}_i

$$\begin{array}{r} \text{add } 3750 \\ + 3970 \\ \hline 7720 \end{array} \quad \text{then divide } \frac{3860}{2} \sqrt{7720}$$

resulting in $\bar{X}_i = 3860$ psi

to determine R_i

$$\begin{array}{r} \text{subtract } 3970 \\ - 3750 \\ \hline 220 \end{array}$$

resulting in $R_i = 220$ psi

2. Calculate the individual set coefficient of variation V_i (expressed as a percentage) for each set by using X_i and R_i :

$$V_i = \frac{R_i \cdot d}{X_i} \cdot 100$$

where for a set of 2 cylinders $d = 0.886^*$
for a set of 3 cylinders $d = 0.591$

EXAMPLE: using numbers calculated above

$$V_i = \frac{(220) \cdot (0.886)}{3860} \cdot 100$$

resulting in $V_i = 5.14\%$

* Derived from table B2 ASTM STP 15-C

3. Calculate the average coefficient of variation V of all the sets selected for the week:

$$\bar{V} = \frac{\sum_{1}^{n} V_i}{n}$$

where: n = number of sets selected for the week

EXAMPLE: for six (6) sets of V_i with values
 5.14, 4.27, 3.35, 2.57, 3.98, 2.75

add 5.14		then divide $\frac{3.68}{6 / 22.06}$
4.27		
3.35		
2.57		
3.98		
+ 2.75		
<hr/>		
22.06		

resulting in $\bar{V} = 3.68\%$ for this week

4. Calculate the moving average coefficient of variation V of the weekly averages for the five most recent weeks for which tests were performed:

$$V = \frac{\sum_{1}^{5} \bar{V}}{5}$$

Note: When calculating V , do not include weeks for which no tests were performed, i.e., do not average zero's into the 5 week running average.

EXAMPLE: for five (5) weeks with averages of
 3.68, 4.97, 8.60, 2.90, 5.33

add 3.68		then divide $\frac{5.09}{5 / 25.48}$
4.97		
8.60		
2.90		
+ 5.33		
<hr/>		
25.48		
<hr/>		
resulting in $V = 5.09\%$		

=

5. Rate the five week moving average coefficient of variation V as follows:

<u>V</u>	<u>Rating</u>
below 5.0%	satisfactory (SAT)
above 5.0%	unsatisfactory (UNSAT)

TABULATION

Formal tables must be maintained to provide a running check on testing operations. Suggested forms (see Note) are shown by Tables II and III. Table II is a daily record of tests for monitoring individual set within-test variation. Table III is a weekly and five (5) week record of average within test coefficients of variation. An example of Table III is shown below.

Week Ending	Approximate Number of Tests for Week	No. of Tests Sampled for Week	No. of Vi Exceeding 10%	Weekly Avg. V(%)	5 Week =Avg. V(%)	Rating
3/3	85	10	0	3.68		
3/10	110	10	0	4.97		
3/17	100	10	2	8.60		
3/24	125	10	1	2.90		
3/31	115	10	0	5.33	5.10	UNSAT
4/7	90	10	1	7.00	5.76	UNSAT
4/14	140	10	3	11.00	6.97	UNSAT
4/21	130	10	1	4.20	6.09	UNSAT
4/28	145	10	1	4.50	6.41	UNSAT
5/5	120	10	0	3.05	5.95	UNSAT
5/12	140	10	0	2.00	4.95	SAT
5/19	160	10	0	4.00	3.55	SAT
5/26	180	10	0	3.70	3.45	SAT
6/2	170	10	0	4.31	3.41	SAT

Note: If tables are generated by ADP equipment, please use a format as close as possible to the one shown.

INTERPRETATION

The limits for the values obtained in the analysis are:

Vi - should not exceed 10% more than one time out of 20 sets selected
=
V - should not exceed 5% for any period

If either of the above limits are exceeded the laboratory should investigate and take appropriate action to locate and correct the problem. Documentation detailing the investigation and corrective action must be maintained by the laboratory.

SUMMARY OF REQUIREMENTS FOR WITHIN-LABORATORY PROGRAM

A laboratory must:

1. Implement a within-laboratory proficiency program within 90 days after the date of application for accreditation;
2. Document the corrective actions used to respond to problem areas identified by out of tolerance results on the within-test variation table;
3. Maintain the within-test variation tables developed, as shown in Tables II and III, along with a summary of any corrective actions taken, for review by the on-site assessor.



TABLE II

National Voluntary Laboratory Accreditation Program
for
Freshly Mixed Field Concrete

RECORD OF TESTS SELECTED FOR MONITORING INDIVIDUAL SET WITHIN-TEST VARIATION

Company Name:
Supervisor's Name:

NVLAP Lab Code:
Date of Submission:



TABLE III

National Voluntary Laboratory Accreditation Program
for
Freshly Mixed Field Concrete

WITHIN-LABORATORY PROFICIENCY PROGRAM

Company Name:
Supervisor's Name:

NVLAP Lab Code:
Date of Submission:

U.S. DEPT. OF COMM. BIBLIOGRAPHIC DATA SHEET (See instructions)		1. PUBLICATION OR REPORT NO. 89-4039	2. Performing Organ. Report No.	3. Publication Date MARCH 1989
4. TITLE AND SUBTITLE NVLAP Program Handbook-Construction Testing Services				
5. AUTHOR(S) Robert L. Gladhill				
6. PERFORMING ORGANIZATION (If joint or other than NBS, see instructions) NATIONAL BUREAU OF STANDARDS U.S. DEPARTMENT OF COMMERCE GAIITHERSBURG, MD 20899			7. Contract/Grant No.	8. Type of Report & Period Covered
9. SPONSORING ORGANIZATION NAME AND COMPLETE ADDRESS (Street, City, State, ZIP)				
10. SUPPLEMENTARY NOTES				
<input type="checkbox"/> Document describes a computer program; SF-18S, FIPS Software Summary, is attached.				
11. ABSTRACT (A 200-word or less factual summary of most significant information. If document includes a significant bibliography or literature survey, mention it here)				
<p>This document explains the operation and technical requirements of the Laboratory Accreditation Program for Construction Testing Services. All of the steps leading to accreditation are discussed. Technical requirements are explained indicating how the NVLAP criteria are applied.</p> <p>It is intended for use by staff of accredited laboratories, those seeking accreditation, other laboratory accreditation systems, and others needing information on the requirements for NVLAP accreditation.</p>				
12. KEY WORDS (Six to twelve entries; alphabetical order; capitalize only proper names; and separate key words by semicolons) accreditation; assessment; construction; concrete; laboratory; proficiency testing; soils; testing				
13. AVAILABILITY			14. NO. OF PRINTED PAGES 47	15. Price
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